

## FLIGHT DEMONSTRATION OF A 10 K SORPTION CRYOCOOLER

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The Brilliant Eyes Ten-Kelvin Sorption Cryocooler Experiment (BETSCE), manifested for flight on STS-77 in May 1996, is the first-ever spaceflight demonstration of sorption cryocooler technology. BETSCE was aimed at measuring and validating critical microgravity performance characteristics of a hydride sorption cryocooler designed to cool long-wavelength infrared and submillimeter-wavelength detectors to 10 K and below. The flight validation data provided by BETSCE will enable insertion of periodic and continuous-operation long-life (> 10 years), low-vibration, low-power consumption refrigeration technology into future precision-pointing surveillance, earth-observation, and astrophysics space satellite applications.

The sorption cryocooler alternately heats and cools beds containing metal hydride powders to circulate hydrogen as the refrigerant fluid in a closed cycle. On command, it periodically cools a cold head assembly to below 10 K within 90 seconds.

This paper describes how BETSCE successfully achieved its primary objectives of: (1) demonstrating the microgravity performance of critical sorption technologies and acquiring the needed flight performance data, (2) identifying and resolving interface and integration issues, and (3) providing hardware qualification and safety verification heritage.

BETSCE was an example of a **successful** collaborative team effort between industry, university and government. JPL was responsible for the overall project management, system design and integration, and development of the mechanical, thermal, electronics, and fluid subsystems. The **sorbent** beds were developed and fabricated by Aerojet Electronics Systems Division, the cryostat was developed and fabricated by APD Cryogenics, Inc., and the upper stage tactical Stirling coolers were provided by Hughes Aircraft Corp.

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